

doubt Pliny has indicated the two genera *Murex* and *Purpura* of the moderns by the names *Purpura* and *Buccinum*. It is probable that *Murex trunculus* and *brandaris*, and *Purpura hæmastoma*, were employed by the dyers; but it would be difficult to identify the different species indicated by Pliny. Zoological investigations, accompanied by experiments which are all simply and easily made, would perhaps lead to results more definite than can be obtained by the interpretation of passages, if one could carry them out on the shores of countries formerly famous for their purple—those of Tyre for example.

## GEOLOGICAL SOCIETY.

June 13, 1860.—L. Horner, Esq., President, in the Chair.

“On the Ossiferous Caves of the Peninsula of Gower, in Glamorganshire, South Wales.” By H. Falconer, M.D., F.R.S., F.G.S. With an Appendix, on a Raised Beach in Mewslade Bay, and on the occurrence of the Boulder-clay on Cefn-y-bryn; by J. Prestwich, Esq., F.R.S., Treas.G.S.

The object of this communication was to give a summary of researches made during the last three years by the author and Lieut.-Col. E. R. Wood, F.G.S., the latter of whom has carefully explored at his own charge, since 1848, some of the caves previously known, as well as several discovered by himself. The known bone-caves of Gower (of which Paviland, Spritsail Tor, and Bacon Hole have already supplied Dr. Buckland and others to some extent with materials for the history of the Cave-period) are in the Carboniferous Limestone; and, with the exception of that of Spritsail Tor, which is on the west coast of the peninsula, they all occur between the Mumbles and the Worm’s Head. The most important are “Bacon Hole,” “Minchin Hole,” “Bosco’s Den,” “Bowen’s Parlour,” “Crow Hole,” “Raven’s Cliff Cavern,” and lastly the well-known “Paviland Cave.” Bone-caves formerly existed at the Mumbles, in Caswell Bay, and in Oxwich Bay; but the sea has destroyed them. One cavern named “Ram Tor” between Caswell Bay and the Mumbles, presumed to be ossiferous, remains unexplored.

Before proceeding to describe the bone-caves and their contents, the author briefly noticed a raised beach and talus of breccia, which Mr. Prestwich had lately traced for a mile along Mewslade Bay, westward of Paviland; and he pointed out their important relationship to the marine sands and overlying limestone-breccia found in several of the Gower Caves. Dr. Falconer also referred to Mr. Prestwich’s recent discovery of some patches of Boulder-clay on the highland of Gower, and in Rhos Sili Bay.

“Bacon Hole” was first treated of. It has been worked out by Colonel Wood, and described by Mr. Starling Benson. On the limestone-floor of the cave are:—(1) a few inches of marine sand, abounding with *Litorina rudis*, *L. littoralis*, and *Clausilia nigricans*, with bones of an *Arvicola* and Birds; (2) a thin layer of stalagmite; (3) two feet or less of blackish sand, containing a mass of bones of *Elephas antiquus*, with remains of *Meles taxus* and *Putorius* (*vul.*  
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garis?); (4) one to two feet of ochreous cave-earth, limestone-breccia, and sandy layers, with remains of *Elephas antiquus*, *Rhinoceros hemitæchus*, *Hycæna*, *Canis lupus*, *Ursus spelæus*, *Bos*, and *Cervus*; (5) irregular stalagmite, partly enveloping a huge tusk of an Elephant imbedded below it; (6) limestone-breccia and stalagmite, from 1 to 2 feet thick, with bones of *Ursus* and *Bos*; (7) irregular bed of stalagmite, 1 foot or more, with *Ursus*; (8) dark-coloured superficial earth, kept sappy by abundant drip, with bones of *Bos*, *Cervus*, *Canis vulpes*, horns of Reindeer and Roebuck, together with shells of *Patella*, *Mytilus*, *Purpura*, *Litorina* (probably brought into the cavern as food by birds), and also pieces of ancient British pottery. The marine sand at the bottom of "Bacon Hole" was analogous to that on the rocky floor of the San Ciro Cave, near Palermo; but contained fewer species of Mollusca. The uppermost layer of stalagmite is about 30 feet above high water. The Elephant-remains belonged to at least three individuals, one of which was adult, and one young with milk-dentition.

"Minchin Hole" is the grandest and most spacious of all the Gower Caves, being 170 feet long, by 70 feet where widest, and 35 feet high at the entrance. Here the section gave:—(1) Loose limestone-breccia, 3 feet; (2) Yellow cave-earth, 9 inches; (3) Sand, 1 foot; (4) Blackish sandy loam containing abundant remains of *Rhinoceros*, *Elephas*, and *Bos*,  $2\frac{1}{2}$  feet; (5) Greyish-yellow marine sand, varying in thickness from 1 to 4 feet, and resting on the rocky floor. Some of the lower jaws of *Rhinoceros* from this deposit exhibit *Litorinæ* and comminuted shells imbedded in the encrusting matrix: and the black sand yielded *Helix hispida* similarly attached. In the interior, the cave-earth was thicker, and the black sandy loam more unctuous. The mammalian remains were closely analogous with those from Bacon Hole; but the Elephant-remains (*E. antiquus*) were fewer, and those of *Rhinoceros hemitæchus* were more numerous and better preserved, including two skulls. No remains of *Elephas primigenius* or of *Rhinoceros tichorhinus* were met with in Bacon Hole or Minchin Hole.

"Bosco's Den" is a cavernous fissure, of great interest, between "Bacon Hole" and "Minchin Hole." It is about 70 feet high, and has been worked out by Col. Wood, who, having succeeded in reaching a hole called (by the quarrymen) "Bacon's Eye," found it to be an angular opening ( $2\frac{1}{2}$  feet in diameter) at the top of one of the great vertical fissures in the limestone, and leading into a fine cavern. Beneath it the fissure was filled up with a mass of angular fragments of limestone (with bones, teeth, and land shells) impacted in ochreous loam, about 20 feet in height, resting on a solid platform of breccia, beneath which the fissure had to a great extent been washed out by the sea. On enlarging the aperture, by undermining the projecting mass of loam and breccia, a cavity was found extending 76 feet backwards, with a width of from 7 to 16 feet, and a general height of about 15 feet. A line of fissure runs along the angle of the roof, and towards the outer part of the cavern the crack widens into an irregular flue, which had evidently communicated with the surface:

here the cavern rises to a height of 40 feet. When first opened, the eastern wall only of the cavern was found to be coated with stalagmite. The floor was tolerably smooth, and shelved down gradually from the mouth to the extremity, the deposits being thicker outwards. The floor having been excavated down to the hard breccia, there were observed:—(1) at the top, a bed of sandy peat or turf, formed chiefly of bits of sticks and comminuted vegetable matter, about 1 foot thick, except under the flue, where it formed a low conical heap. In or on this peaty covering were bones of Ox and Wolf, and bones and broken shed antlers of Deer, of species or varieties allied to the Reindeer (*Cervus Guettardi* and *Cerv. priscus*). (2) Stalagmite, regular, but usually less than a foot thick. At one spot it rose into a boss 2 ft. 3 in. high, which was found in a shattered condition, the fragments being loose, but still in place. This must indicate—1st, the operation of some shock since the formation of the stalagmite, and even since the peat began to be formed; and 2ndly, the absence of drip in the cave since the shock took place. (3) Sandy loam, 1 ft. 4 in., with fragments of rock and without bones; (4) sand, 2 ft. 6 in.; (5) a bed of loose stony breccia, 4 feet, without bones; (6) ochreous loam, or the usual cave-earth, 6 to 7 feet thick, resting on the solid cemented breccia which forms a floor or diaphragm between the upper and lower chambers of the fissure. *Ursus spelæus*, *Canis lupus*, *C. vulpes*, *Bos*, *Cervus*, and *Arvicola* occur in the loam, the latter in abundance. The most remarkable circumstance about these remains was the great excess of Deers' antlers above the others. Upwards of one thousand antlers, mostly shed and of young animals belonging chiefly to *Cervus Guettardi*, were collected. The lower chamber was penetrated by Col. Wood, Dr. Falconer, and a friend last September, and found to have been washed out by the sea to a depth inwards of 31 feet; and at its extremity they met with a compact mass of marine sand and gravel, about 9 feet thick. The solid breccia forming the roof of the lower, and the base of the upper cave, increases in thickness from 6 feet at the outside to a greater depth inwards. Its materials correspond with the bed of angular *débris* observed by Mr. Prestwich on the raised beach of Mewslade Bay.

“Bowen's Parlour,” or “Devil's Hole,” is also a cavernous fissure in the limestone cliff, situated between Bosco's Den and Crow Hole. It has been washed out by the sea,—portions only of its cave-deposits remaining, especially a diaphragm of cemented breccia, which divides the fissure into an upper and lower story—the former about 20 feet high at the mouth, the latter 14. Thin tabular aggregations of sand adhere to the lower surface of the partition, showing that it was deposited on a bed of sand. The same phenomena are repeated in “Crow Hole” with modifications, the cave-deposits being still *in situ*: here remains of *Ursus*, *Meles*, *Rhinoceros*, and some other forms have been found by Col. Wood.

“Raven's Cliff” presents a cavernous fissure broad and high externally, contracted within. Here a thin crust of stalagmite formed a floor upon sand 9 feet thick, which filled the fissure close



up to the roof, leaving only an empty angular chamber about a foot high above the stalagmite. Upon the latter, remains of *Mustela foina*, *Canis vulpes*, and some Fish-bones and Bird-bones were found. In the sand large coprolites of Carnivores, some fine remains of *Felis spelæa*, bones of *Rhinoceros*, and the vertebræ of a Fish were discovered. Below the sand, as usual in the Gower Caves, there was a sandy breccia cemented by stalagmite, about a foot thick. Upon it a large block of limestone, smoothed and polished, probably by the rubbing of passing cave-animals, was discovered; and patches of polished surface were seen on the walls of the cave. Remains of *Elephas*, *Rhinoceros*, *Bos*, and *Cervus* were met with above the breccia. Below the breccia was a bed of dark-grey gritty sand, indurated by calcareous infiltration, and attaining a maximum thickness of about 8 feet. In this sand, and close upon the rock-floor, teeth of *Hippopotamus major*, young and old, and remains of *Ursus*, *Cervus*, and *Arvicola*, were met with. There was evidence, on the cliff beyond the aperture, of the cave and its contents having formerly been continued further seawards.

The author pointed out that in all these caves the bottom appears to have been first filled with sea-sand or shingle, with which were occasionally intermingled the bones of pachyderms, ruminants, &c., then living on the emerged land of Gower; that when this deposit was elevated above high-water mark, stalagmite and angular *débris* of limestone rock formed a floor, on which subsequently cave-earth or other common alluvial materials, with bones and antlers, often in profusion, were accumulated through the fissure above, during a long lapse of time after the rise had been accomplished. At last, by a converse action, of comparatively modern date, the level of the caves was depressed. The raised beach at Mewslade Bay, which appears, according to the evidence of Mr. Prestwich, to be of later date than the Boulder-clay, has without doubt partaken of changes of level similar to what the caves and their contents have undergone, although, the marine deposits in the caves not being at a uniform level either in relation to each other or to the raised beach, it is probable that there have been locally unequal depressions of level in comparatively modern times. The author thinks that the sea has effected but a comparatively slight inroad on the cave-deposits and raised beach; and hence he infers that they belong to a relatively modern epoch—seeing also that they are probably of later date than the Boulder-clay period, and rest on marine sands containing existing species of shells.

Paviland Cave was next referred to; but the author restricted his remarks to the remains of *Elephas primigenius* and human bones that were found in it, and argues that the latter (*i. e.* the skeleton of the "Red Lady") are of more recent date than the former.

In the cave at Sprintsail Tor (cursorily examined by Sir H. De la Beche, and thoroughly explored by Colonel Wood), under a stalagmitic bone-breccia, the irregular fissure of the rocky floor was impacted with ochreous cave-earth full of bones and teeth of *Elephas antiquus*, *E. primigenius*, *Rhinoceros tichorhinus*, *Equus*, *Sus*, *Bos*,

*Cervus*, *Lepus*, *Arvicola*, *Mus*, *Ursus spelæus*, *U. priscus*(?), *Felis spelæa*, *Hyæna spelæa*, *Canis lupus*, *C. vulpes*, *Meles taxus*, and *Mustela*. Coprolites of *Hyæna*, gnawed bones of *Bos*, *Equus*, and *Cervus*, and a great abundance of the detached molars of Horse, gave the cave the undoubted character of having been a Hyæna's den. In the superficial sand on the stalagmite, the antlers of a Reindeer and some human bones were found.

General remarks on the distribution of the Mammalian remains in the different caverns were offered, and the special anomalies pointed out; and, after a comparative review of the fauna of the Gower bone-caves in relation to that of other cave-districts of England in particular, and of Europe in general, the author arrived at the following conclusions as being consistent with the existing state of our knowledge:—

1. That the Gower Caves have probably been filled up with their mammalian remains since the deposition of the Boulder-clay.

2. That there are no mammalian remains found elsewhere in the ossiferous caves in England and Wales referable to a fauna of a more ancient geological date.

3. That *Elephas (Loxodon) meridionalis* and *Rhinoceros Etruscus*, which occur in, and are characteristic of, the "Submarine forest Bed" that immediately underlies the Boulder-clay on the Norfolk coast, have nowhere been met with in the British caverns.

4. That *Elephas antiquus* with *Rhinoceros hemitæchus*, and *E. primigenius* with *Rh. tichorhinus*, though respectively characterizing the earlier and later portions of one period, were probably contemporary animals; and that they certainly were companions of the Cave-Bears, Cave-Lions, Cave-Hyænas, &c., and of some at least of the existing mammalia.

#### ZOOLOGICAL SOCIETY.

June 12, 1860.—Dr. Gray, F.R.S., V.P., in the Chair.

#### DESCRIPTIONS OF TWENTY-TWO NEW SPECIES OF HUMMING-BIRDS. BY JOHN GOULD, F.R.S., ETC.

As my work on the *Trochilidæ* is now fast drawing to a close, I have examined with care and minute detail my entire collection of this great and important family of birds, and I find therein more than twenty species, which, I believe, have not yet received specific appellations. Many of these I have had by me for years, while others have been more recently acquired. Of the specific value of those described in the following pages I am perfectly satisfied; but in case any doubt should be entertained on the subject, my collection is, and will be, at all times accessible for their elucidation.

#### GRYPUS SPIXI, Gould.

Crown of the head bronzy-brown; upper surface and all the tail-feathers very rich reddish-bronze; wings reddish purple-brown; line above the eye buff; ear-coverts dark-brown; throat, chest and under surface deep reddish-buff; under tail-coverts bronzy, each slightly